



UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Youichirou Sugino et al.

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For: ADHESIVE FOR POLARIZING PLATE, POLARIZING PLATE,  
FABRICATION METHOD THEREFOR, OPTICAL FILM AND IMAGE DISPLAY

DECLARATION UNDER RULE 1.132

Commissioner for Patents

P.O.Box 1450

Alexandria, VA 22313-1450

Sir:

I, Youichirou Sugino, a citizen of Japan and residing at 1-1-2, Shimohozumi, Ibaraki-shi, Osaka, 567-8680 Japan, c/o: CUSTOMER TECHNICAL SUPPORT GROUP, SALES SECTOR, OPTICAL RELATED DIVISION of NITTO DENKO CORPORATION, declare and Say as follows:

1. I was graduated from Department of Applied Chemistry, faculty of Engineering, Nagoya University in 1998.

2. Since 1998 to the present time, I have been employed by NITTO DENKO CORPORATION, and have worked in research and development related to optical field concerned to polarizing plate.

3. I am one of the inventors of the above-identified application and familiar with the subject matter thereof.

4. I have read the Official Action mailed and the references cited therein and are familiar with the subject matter thereof.

5. Contents of Experiments:

Experiment was conducted to Reference Example 1 for comparison with Example 1 and Comparative Example 1 in the specification as filed.

The Reference Example 1 was conducted shown below, according to a similar way of the Example 1 of the specification as filed with the exception that the thickness of adhesive agent layer is as shown in Table 1 described below. And a polarizing plate obtained in Reference Example 1 was evaluated according to a similar way of the specification as filed. See below for details.

Reference Example 1  
(Polarizer)

A polyvinyl alcohol film having a thickness of 75  $\mu\text{m}$ , an average polymerization degree of 2400 and a saponification degree of 99.9 mol % was immersed in warm water of 30°C for 60 sec and swollen. Then, the swollen film was further immersed in an aqueous solution of iodine and potassium iodide (at a ratio of iodine to potassium iodide = 0.5 to 8 in weight) at a concentration of 0.3 % and thereby dyed while being stretched by 3.5 times. Thereafter, the film was further stretched in a boric acid ester aqueous solution at 65°C to a total stretch ratio of 6. After the second stretching, the stretched film was dried in an oven at 40°C for 3 min to obtain a polarizer.

(Transparent Protective Film)

A triacetyl cellulose film having a thickness of 80  $\mu\text{m}$  was used.

(Preparation of Adhesive)

Dissolved into pure water in a temperature condition of 30°C are 100 parts of a polyvinyl alcohol-based resin having an

acetoacetyl group (with an average polymerization degree of 1200, a saponification degree of 98.5 mol % and an acetoacetylation degree of 5 mol%) and 32 parts of methylolmelamine to prepare an aqueous solution adjusted to have 4% of the solid matter concentration.

#### (Fabrication of Polarizing Plate)

The adhesive was coated on one surface of the transparent protective film to form an adhesive layer having a thickness of 100nm after drying. The coating of the adhesive was performed in a temperature condition of 30°C when 30 min elapsed after preparation of the adhesive. Triacetyl cellulose films coated with the adhesive were adhered onto both surfaces of the polarizer at a temperature condition of 30°C with a roll laminator and thereafter, the polarizer with triacetyl cellulose films are dried at 55°C for 6 min to thereby fabricate a polarizing plate.

#### (Evaluation)

The following kinds of evaluation were performed on the polarizing plate obtained in Reference Example 1.

#### (Peeling Length)

A sample was prepared by cutting a polarizing plate to obtain a piece having dimensions of 50 mm in the absorption axis direction of the polarizer and 25 mm in a direction perpendicular to the absorption axis thereof. The sample was immersed in warm water of 60°C and a peeling length (mm) at an end portion of the sample was measured with the passage of time. Measurement of a peeling length (mm) was performed with a vernier caliper. Peeling lengths with time are shown in Table 1 described below.

#### (Decolorization of Iodine)

Decolorization of iodine in a polarizer was confirmed with the following decolorization evaluation method. That is, a sample

was cut off from a fabricated polarizing plate in the central portion in the width direction to obtain a piece in a way such that a size thereof is 50 mm x 25 mm and a long side thereof forms an angle of 45 degrees relative to the absorption axis of the polarizing plate, and a single transmittance (%) was measured with an integrating sphere transmittance measuring instrument (a trade name of DOT-3C, manufactured by MURAKAMI COLOR RESERCH LABORATORY). Another sample was, in a similar manner, cut off from the polarizing plate after immersion in water for 3 hr and a single transmittance (%) was measured on the sample to thereby obtain a difference therebetween ( $|\Delta T\%|$ ).

#### (Appearance Evaluation)

A sample was prepared by cutting off from a polarizing plate to obtain a piece in a way such that a size thereof is 100 mm x 100 mm. The sample is illuminated with light from a fluorescent lamp and appearance evaluation was visually performed with respect to the presence or absence of in-plane non-uniformity with reflection of light from the fluorescent lamp using the following criteria of "uniformity" indicated by symbol O and "non-uniformity" indicated by symbol X, respectively.

The result of Reference Example 1 is shown with the results of Example 1 and Comparative Example 1 in Table 1 described below.

Further, as for "Appearance Evaluation", regarding to Reference Example 1 and Example 1, in-plane non-uniformity of the polarizing plate were specifically observed with sending pin profilometer (Microfigure Measuring Instrument SURFCORDER ET4000, made by Kosaka Laboratory LTD.). Samples were prepared by cutting off from the polarizing plates to obtain a piece in a way such that a size thereof is 40 mm in MD (machine direction) x 100 mm in TD (transverses direction). Measuring pitch was performed

with 10mm in MD, and 0.04mm in TD.

Image processing, which was done fifty-one item average to remove swell of the polarizing plate, of in-plane non-uniformity of the polarizing plate was performed with the above measured result.

The results of Reference Example 1 and Example 1 are shown in Figures 1 and 2 described below with  $\sigma$  value( $\mu\text{m}$ ) which is uniformity index. The smaller the  $\sigma$  value the more the uniformity.

#### Discussion:

Reference Example 1 is different from Example 1 only in the thicknesses of the adhesive layer. The difference of the adhesive layer between Reference Example 1 and Example 1 is shown as the below result. That is, the thickness of the adhesive layer of Reference Example 1 exceeds 95 nm, therefore, appearance related to uniformity was not satisfied.

On the other hand, Reference Example 1 is different from Comparative Example 1 only in the mixing content of the crosslinking agent. The mixing content of the crosslinking agent of Comparative Example 1 is less than 30 parts by weight relative to 100 parts by weight of a polyvinyl alcohol-based resin having an acetoacetyl group, therefore, appearance related to uniformity was satisfied, but not be satisfied the Peeling length and decolorization of iodine: changes in single transmittance.

Table 1

	Crosslinking agents		Control temperature (°C)	Thickness of adhesive layers (nm)	Times elapsing till coating with adhesive after preparation thereof (min)	Peeling lengths when 5 hr elapses (mm)	Decolorization of iodine: changes in single transmittance	Appearance evaluation
	Kinds	Mixing content (parts)						
Example 1	Methylol melamine	32	30	80	30	0	0.425	o
Comparative Example 1	Methylol melamine	23	23	100	30	0.5	0.842	o
Reference Example 1	Methylol melamine	32	30	100	30	0.2	0.530	x

Figure 1: related to Reference Example 1

$\sigma$  value was  $0.081 \mu\text{m}$

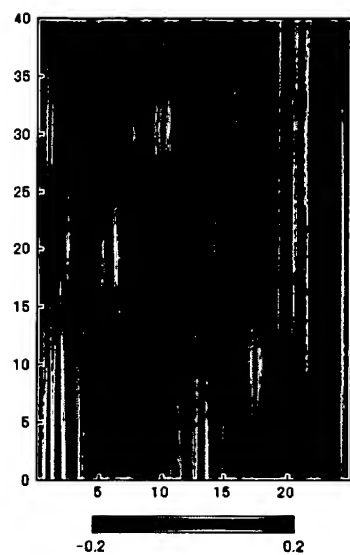
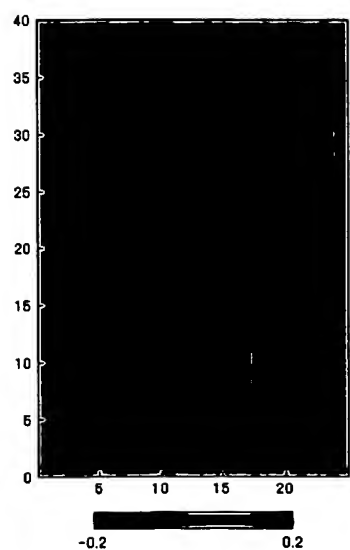


Figure 2: related to Example 1

$\sigma$  value was  $0.031 \mu\text{m}$



7. I declare further that all statements made herein of my own knowledge are true, and that all statements on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-identified application or any patent issuing thereon.

Date , 2009/4/24

Youichirou Sugino

Youichirou Sugino